

Claims

1. A method for controlling the expansion properties of thermally expandable sulfuric acid-graphite particles, wherein the sulfuric acid-graphite particles, produced by the reaction of graphite particles with sulfuric acid in the presence of an oxidizing agent, washed with an aqueous washing liquid, containing the compounds affecting the expansion properties, to a pH ranging from 2 to 8, measured in the washing liquid separated from the washed sulfuric acid-graphite particles, and then dried.
2. The method of claim 1, wherein the sulfuric acid-graphite particles are washed with an aqueous washing liquid, containing the compounds affecting the expansion properties, to a pH ranging from 3 to 7.
3. The method of claim 1, wherein the washing liquid contains, as compound affecting the expansion properties of the sulfuric acid-graphite particles, at least one representative of the group comprising sulfates, hydrogen sulfates, sulfites, hydrogen sulfites, nitrates, phosphates, hydrogen phosphates dihydrogen phosphates and acetates of sodium, potassium, magnesium, manganese, iron, copper, zinc and aluminum; hydrogen peroxide, iodic acid, bromic acid, permanganic acid, perchloric acid and peroxydisulfuric acid; peroxides, iodates, bromates, permanganates, perchlorates and peroxydisulfates of sodium and potassium; sodium salts of benzenesulfonic acid, 1,3-benzenedisulfonic acid, C₁ to C₃₀ alkylbenzenesulfonic acid, naphthalenesulfonic acid, aromatic and aliphatic aminosulfonic acids, and C₁ to C₃₀ alkylsulfonic acids, sodium C₁ to C₃₀ alkyl sulfates; sodium salts of saturated or unsaturated aliphatic C₂ to C₃₀ carboxylic acids; and saturated or unsaturated, aliphatic, quaternary ammonium salts of formula N(R)₄⁺X⁻, in which R independently of one another represents C₁ to C₃₀ alkyl groups and X⁻ represents an anion, in dissolved or dispersed form.

4. The method of claim 1, wherein the washing liquid contains the compound, affecting the expansion properties, in a concentration of 10^{-5} to 10 moles/L and preferably of 10^{-4} to 1 mole/L.

5. The method of claim 1, wherein the washing liquid contains, as compound increasing the expansion volume (%/mg) of the sulfuric acid-graphite particles, at least one representative of the group comprising Na_2SO_4 , K_2SO_4 , MgSO_4 , CuSO_4 , ZnSO_4 , $\text{Al}_2(\text{SO}_4)_3$, $(\text{NH}_4)_2\text{S}_2\text{O}_8$, NaBrO_3 , CH_3COONa , NaH_2PO_4 , sodium benzenesulfonate, trisodium naphthalenetrisulfonate, sodium 1-butanesulfonate, sodium 1-decanesulfonate, sodium dodecylbenzenesulfonate, sodium toluenesulfonate, tetraethylammonium bromide, decyltrimethylammonium bromide, dodecyltrimethylammonium bromide, tetradecyltrimethylammonium bromide, octadecyltrimethylammonium chloride, sodium acetate, sodium propionate, sodium stearate, sodium oleate and sodium benzoate, in dissolved or dispersed form.

6. The method of claim 1, wherein the washing liquid contains, as compound increasing the expansion rate (%/°C) of the sulfuric acid-graphite particles in the onset region, at least one representative of the group comprising Na_2SO_4 , K_2SO_4 , MgSO_4 , MnSO_4 , CuSO_4 , ZnSO_4 , $\text{Al}_2(\text{SO}_4)_3$, $(\text{NH}_4)_2\text{S}_2\text{O}_8$, KMnO_4 , NaBrO_3 , H_2O_2 , NaNO_3 , NaH_2PO_4 , sodium benzenesulfonate, in a concentration of less than 0.0125 moles/L, sodium 1-butanesulfonate, sodium 1-decanesulfonate, sodium dodecylbenzenesulfonate, sodium toluenesulfonate, tetraethylammonium bromide, dodecyltrimethylammonium bromide, octadecyltrimethylammonium chloride, sodium acetate, sodium propionate, sodium stearate, sodium oleate and sodium benzoate, in dissolved or dispersed form.

7. The method of claim 1, wherein the washing liquid contains, as compound increasing the average expansion coefficient (per °K) of the sulfuric acid-graphite particles, at least one representative of the group comprising Na_2SO_4 , K_2SO_4 , MgSO_4 , MnSO_4 , CuSO_4 , ZnSO_4 , $\text{Al}_2(\text{SO}_4)_3$, $(\text{NH}_4)_2\text{S}_2\text{O}_8$, NaBrO_3 , NaH_2PO_4 , sodium

benzenesulfonate, sodium 1-butanesulfonate, sodium 1-decanesulfonate, sodium toluenesulfonate, tetraethylammonium bromide, decyltrimethylammonium bromide, dodecyltrimethylammonium bromide, tetradecyltriethylammonium bromide, octadecyltrimethylammonium chloride, sodium acetate, sodium propionate, sodium stearate, sodium oleate and sodium benzoate, in dissolved or dispersed form.

8. The method of claim 1, wherein the washing liquid contains as compound, lowering the expansion volume (%/mg) of the sulfuric acid-graphite particles at least one representative of the group comprising MnSO_4 , Fe_2SO_4 , KMnO_4 , H_2O_2 , NaNO_3 , sodium naphthalenesulfonate, disodium 1,5-naphthalenesulfonate and sodium caprylate, in dissolved or dispersed form.

9. The method of claim 1, wherein the washing liquid contains as compound, lowering the expansion rate (%/°C) of the sulfuric acid-graphite particles in the onset range, at least one representative of the group comprising FeSO_4 ; sodium benzenesulfonate in a concentration of ≥ 0.0125 moles/L, decyltrimethylammonium bromide, tetradecyltrimethylammonium bromide, sodium naphthalenesulfonate, disodium 1,5-naphthalenedisulfonate, trisodium naphthalenetrisulfonate and sodium caprylate, in dissolved or dispersed form.

10. The method of claim 1, wherein the washing liquid contains, as compound lowering the average expansion coefficient (per °K) of the sulfuric acid-graphite particles, at least one representative of the group comprising FeSO_4 , KMnO_4 , H_2O_2 , NaNO_3 , sodium naphthalenesulfonate, disodium 1,5-naphthalenedisulfonate, trisodium naphthalenetrisulfonate, sodium dodecylbenzenesulfonate and sodium caprylate, in dissolved or dispersed form.

11. Intumescent fire-retarding additives for producing fire-retarding compositions for sealing wall bushings and other openings in walls, floors and ceilings of buildings, comprising thermally expandable sulfuric acid-graphite particles, produced by the

reaction of graphite particles with sulfuric acid in the presence of an oxidizing agent, washed with an aqueous washing liquid, containing the compounds affecting the expansion properties, to a pH ranging from 2 to 8 measured in the washing liquid separated from the washed sulfuric acid-graphite particles, and then dried.